UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

August 2, 2000

Sonny O'Neal
Forest Supervisor
United States Department of Agriculture
Forest Service
215 Melody Lane
Wenatchee, Washington 98801

Re: Biological Opinion for the Wolf Creek Irrigation Ditch (WSB-98-058)

Dear Mr. O'Neal:

This document transmits the National Marine Fisheries Service's (NMFS) biological opinion (BO) for the reinstatement of a special use permit to the Wolf Creek Reclamation District for the continuing operation of their surface water diversion from Wolf Creek, a tributary to the Methow River, Okanogan County, Washington. This BO analyzes the effects of the proposed action to the endangered Upper Columbia River steelhead (*Oncorhynchus mykiss*) and the endangered Upper Columbia River spring chinook salmon (*O. tshawytscha*), and their designated critical habitats, in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 15311 *et seq.*). Formal consultation was initiated on October 5, 1999.

This biological opinion is based on information provided in a biological assessment (BA) dated March 25, 1998, and subsequent amendments to the BA that fulfilled the informational needs to complete formal consultation. A complete administrative record of this consultation is on file at the Washington State Habitat Branch Office.

The Forest Service has determined that the proposed project is likely to adversely affect the above listed species, but would not jeopardize the continued existence of the species or result in the destruction or adverse modification of their critical habitats.

The enclosed document represents NMFS' biological opinion on the above listed species in accordance with section 7 of the Endangered Species Act of 1973, as amended, (16 U.S.C. 1531 *et seq.*).

In your review of the BO, please note the incidental take statement, which includes reasonable and prudent measures and terms and conditions to avoid and minimize take and avoid jeopardy. Also, please note that we have included conservation recommendations.

Should you have any questions, please contact Dennis Carlson at (360) 753-5828.

Sincerely,

Russell M Strach for

William W. Stelle, Jr.
Regional Administrator

Enclosure

cc: Steven W. Landino, NMFS Washington State Habitat Branch Chief

ENDANGERED SPECIES ACT - SECTION 7

BIOLOGICAL OPINION

FOR THE WOLF CREEK IRRIGATION DITCH
Okanogan National Forest

WSB - 98 - 058

Agency: National Marine Fisheries Service

Consultation
Conducted By: National Marine Fisheries Service
Northwest Region
Washington State Habitat Branch

Approved Russell M Strach for Date August 2, 2000

William W. Stelle, Jr.
Regional Administrator

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I. CONSULTATION HISTORY

The U.S. Department of Agriculture, Okanogan National Forest, Methow Valley Ranger District has requested Endangered Species Act (ESA) section 7 consultation with the National Marine Fisheries Service (NMFS) for the proposed reinstatement of a special use permit to convey water in the Wolf Creek Reclamation District=s (WCRD) irrigation ditch across U.S. Forest Service (USFS) managed land in the Okanogan National Forest near Winthrop, Okanogan County, Washington. A chronology of project events follows:

- On March 20, 1998, a Level 1 team meeting comprised of representatives from the USFS, U.S. Fish and Wildlife Service (USFWS) and NMFS was convened to discuss the proposal;

- On April 23, 1998, the USFS submitted a written request, along with a biological assessment (BA) dated March 25, 1998, to initiate formal section 7 consultation with NMFS;

- Subsequent amendments to the BA and additional information requested from the applicant by the USFS was forwarded to NMFS from March 29, 1999 throughout June 1999; and,

- WCRD requested an interagency meeting on October 5, 1999 to present flow data collected by Terrapin Environmental and analyzed by Golder and Associates. Subsequent meetings were held with WCRD and agency scientists during the fall of 1999 to assess and analyze the operations plan and modeling efforts compiled by the USFS and WCRD.

The October 5 submittal completed the information necessary for NMFS to conduct consultation and the date of initiation for formal consultation is October 5, 1999. On May 9, 2000, NMFS received a draft of the WCRD Irrigation and Operations Plan for Year 2000. On June 13, 2000, NMFS received the Wolf Creek Habitat Restoration Plan dated June 12, 2000. The objective of the WCRD=s operations plan is to employ best available scientific information to protect resident and anadromous fish and their habitat in Wolf Creek while allowing continued use of the present irrigation system with modified infrastructure storage consistent with their water rights. Plan components include modifying the Patterson Lake spillway to seasonally store more water, changing the Haub Brothers Enterprises water rights to allow development of irrigation wells (change in point of diversion), and modifying the flow channel in the lower Wolf Creek floodplain near its confluence with the Methow River.

The objective of this biological opinion (BO) is to determine whether the proposed action is likely to jeopardize the continued existence of the endangered Upper Columbia River steelhead trout (*Oncorhynchus mykiss*) or the Upper Columbia River spring chinook salmon (*O. tshawytscha*), or result in the destruction or adverse modification of designated critical habitat.

The NMFS has reviewed the following information to reach its determination and prepare this BO:

- The available BAs for the Wolf Creek watershed, amendments to the BA, maps, USFS= A2000 Operation and Maintenance Plan@, flow data provided by the applicant and analyzed by Golder and Associates**,** Washington State Department of Ecology (WDOE), and Washington State Department of Fish and Wildlife (WDFW) and WDFW=s A1998 Pre-Irrigation Season Fish Screen Maintenance; Fish Bypass Procedure@, and WCRD=s Irrigation and Operations Plan for Year 2000, and associated attachments, and the Wolf Creek Habitat Restoration Project;

- Telephone conversations and/or meetings conducted by Dennis Carlson and Mike Grady of the NMFS with Jennifer Molesworth, Mel Bennett and Bill Baer of the USFS, Brad Caldwell of WDOE, Hal Beecher of WDFW, and Jodi Bush of the USFWS.

- Reference materials that include the AMethow River Basin Fish Habitat Analysis Using the Instream Flow Incremental Methodology@, Federal Register Notices, the A1992 Washington State Salmon And Steelhead Stock Inventory, Appendix Three, Columbia River Stocks@, "Production and Habitat of Salmonids in Mid-Columbia River Tributary Streams by Mullan et al.," ANMFS Status Review of West Coast Steelhead from Washington, Idaho, Oregon, and California@, AAn Ecosystem Approach to Salmonid Conservation@, and the ANMFS Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California@, and 1999 Wolf Creek flow data compiled by Golder Associates Inc.

- Comments on the Draft Wolf Creek BO dated July 8, 1999 from the USFS and the law firm of McQuaid, Metzler, Bedford & Van Zandt.

II. DESCRIPTION OF PROPOSED ACTION

The USFS has management authority over national forest lands and grants permits for water conveyance across national forest lands to people with valid water rights. The proposed action is for the reinstatement of a special use permit by the USFS to allow the conveyance of water across national forest lands for irrigation and domestic uses. The previous special use permit expired in 1996 and arrangements for the WCRD a permanent easement have been underway with the USFS since 1997. The permit renewal request is for a period of ten years, starting from the date of the previous special use permit that expired in 1996.

A detailed description of the proposed action is provided in the BA and supplemental BAs, with additional project modifications and monitoring measures outlined in the WCRD=s Irrigation and Operations Plan for Year 2000, dated May 9, 2000. A summary of that proposed work follows.

The WCRD holds an adjudicated, class 4 water right for 30 cfs (October 1 to July 1) and 13cfs (July 1 to September 30) that allows diversion from Wolf Creek and Little Wolf Creek (both on USFS land). The maximum amount of water to be used is 3,065-acre feet/year on about 804 acres. The water right allows the storage of 3,640-acre feet in Patterson Lake for irrigation and domestic purposes. A 1989 modification to the water right changed a portion of the irrigation use to domestic to provide additional water to the Sun Mountain Resort for both irrigation and domestic purposes. Patterson Lake has public access and is also used for sport fishing and other water-related recreational activities.

Water is taken from Little Wolf Creek year-round and is the main source of water used to recharge Patterson Lake in the spring. The Wolf Creek ditch is turned on and added to flows from Little Wolf Creek in the spring around April 15, depending on how much water is needed to fill the lake. The capacity of the ditch is about 13 cfs. A maximum of 16 cfs can be withdrawn from the lake for irrigation. The conditions of WCRD's class 4 water right require them to pass at least 7 cfs downstream to the senior water right holders before WCRD can withdraw water.

The WCRD ditch begins about 4 miles up Wolf Creek from the confluence with the Methow River and flows along a 10,542' long-by-30' wide strip of USFS managed land. About 1 mile after leaving Wolf Creek the ditch drops down a flume, descending about 100' in elevation. After descending down the flume the ditch is joined by flow captured from Little Wolf Creek (about 2.5 cfs) and continues to flow toward a series of beaver ponds above Patterson Lake. Outflow from the beaver ponds empties into Patterson Lake where the water is stored and used for irrigation, domestic, and recreational purposes. Water is pumped from Patterson Lake or is diverted down a creek bed toward the floor of the Methow Valley where it is used for irrigation. There is no return surface flow to the Methow River. Prior to installation of a fish screen in August 1999, fish that entered the ditch and went down the flume were unable to migrate back to Wolf Creek and were often stranded in Patterson Lake.

The WCRD irrigation ditch headgate works are located just below the national forest wilderness boundary. In the past, water flow in the ditch channel leading to the headgate works had been restricted because of alluvial material deposition. In August 1999, the WCRD reconstructed the headgate works and used an excavator to remove sand and gravel deposits from in front of and behind the headgate works to ensure adequate flows in the ditch. An existing road was used to access the work site. However, new segments of road were constructed over the portions of the ditch where a pipeline had been installed under ground to improve access to the headgate works. No stream crossings were required. The sand and gravel extraction work, conducted in late August 1999, entailed the removal of approximately 80 cubic yards of sand and gravel from a 15-by 70-foot area. Some of that material was used to stabilize the adjacent lower WCRD ditch bank.

The WCRD also installed a bypass pipe in the ditch to direct fish away from the fish screen back to Wolf Creek**.** An Alaska by-pass was also installed at the existing in-channel diversion weir to allow upstream passage to anadromous and resident fish during low flow periods. All of the above-described work was conducted in August-September 1999 after the USFS had completed informal section 7 consultation with NMFS.

Included in WCRD=s proposal are plans to install approximately 1,100 feet of 21- inch PVC enclosed pipe in the water distribution system and pipe 1,800 feet of open distribution ditch and up to 2,900 feet on Ahigh ditch@ with pressurized PVC as funds are available.

For 2000, the WCRD modified the Patterson Lake spillway to allow more spring peak flows to be captured and stored for use later in the year. That additional storage would be obtained by diverting more flow to the lake from Wolf Creek during spring high runoff flows. Maximum surface water diversion rates during the irrigation season would not exceed 12 cfs and would be limited to maintain at least 8 cfs, as measured at the gauge located at the county bridge crossing Wolf Creek site, and 0.8 foot (9.6 inches) of water depth throughout the travel corridor extending from the county bridge to the confluence of Wolf Creek with the Methow River. The WCRD would modify or curtail surface water diversion and switch to water from Patterson Lake in order to maintain 8 cfs and 0.8 foot water depth. In addition, the Haub Brothers Enterprises Trust proposes to change the point of diversion of its water right to allow development of groundwater irrigation wells located approximately 1 mile southeast of its present diversion. All water from Little Wolf Creek, which does not bear anadromous fish, would continue to be diverted for irrigation and domestic use.

In August of 2000 the WCRD, with technical and financial assistance from the USFWS, proposes to modify the Wolf Creek stream channel from its confluence with the Methow River upstream approximately 400 feet to allow resident and anadromous fish passage through the alluvial deposition area. Eight rock vanes and at least eight root wads would be installed in the lower Wolf Creek channel to provide channel complexity, pool and refugia habitat, and a channel geomorphology configuration that would allow fish passage over a range of natural flows, and in particular during late summer-early fall low baseflow conditions. That proposed work would also include restoring riparian habitat and promote streambank stabilization through the use of planted native vegetation. The proposed in-channel restoration work is the subject of another section 7 consultation previously conducted between NMFS and the USFWS.

Ditch maintenance would occur annually and involves clearing debris from the ditch and access road. Proposed maintenance work would include removal of sloughed soil from cut and fill slopes of the road and ditch, and brush or trees that have fallen over the ditch or access road. In some years, excess sediment accumulations in the ditch are removed. WCRD also plans to replace the top log on its existing diversion dam in Wolf Creek in 2000.

Action Area

The term Aaction area@ means Aall areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." 50 C.F.R. ' 402.02. The action area for this consultation is Wolf Creek, starting at the WCRD diversion at RM 4.0, proceeding downstream to the confluence with the Methow River and extending some distance down the

Methow River from its confluence with Wolf Creek. The precise downstream limit of the action area cannot be easily determined because the extent of indirect effects of the proposed action on Methow River flows vary according to flow stage. Wolf Creek has flow measuring gauges at the Wolf Creek bridge near the confluence with the Methow River and at the WCRD diversion**.**

III. STATUS OF LISTED SPECIES AND BIOLOGICAL REQUIREMENTS

A. Upper Columbia River Steelhead

Upper Columbia River steelhead were listed as endangered pursuant to the ESA on August 18, 1997 (62 Fed. Reg. 43937). Critical habitat for the Upper Columbia River steelhead was designated on February 16, 2000 (65 Fed. Reg. 7764). The listing status, biological information, and other information for the Upper Columbia River steelhead is further described in Attachment 1.

Range-wide factors for the decline of west coast steelhead stocks are primarily attributed to the destruction and modification of habitat, over-utilization for recreational purposes, and natural and human-made factors (NMFS 1996a, 1996b, 1997). Forestry, agriculture, mining, and urbanization have degraded, simplified, and fragmented habitat. Water diversions for agriculture, flood control, domestic, and hydropower purposes (including the Columbia River Basin) have greatly reduced or eliminated historically accessible habitat. Studies estimate that during the last 200 years, the lower 48 states have lost approximately 53 percent of all wetlands and the majority of the rest are severely degraded (Gregory & Bisson 1997). Washington and Oregon=s wetlands are estimated to have diminished by one-third, while California has experienced a 91 percent loss of its wetland habitat (NRC 1996).

Loss of habitat complexity has also contributed to the range-wide decline of steelhead. In portions of some national forests in Washington, there has been a 58 percent reduction in large deep pools due to sedimentation and loss of pool-forming structures such as boulders and large wood (McIntosh et al. 1994). Sedimentation from land use activities is recognized as a primary cause of habitat degradation in the range of West Coast steelhead (62 Fed. Reg. 43942).

Steelhead support an important recreational fishery throughout their range. During periods of decreased habitat availability (e.g., drought conditions or summer low flow when fish are concentrated), the impacts of recreational fishing on native anadromous stocks may be heightened (62 Fed. Reg. 43942). Steelhead are not generally targeted in high seas commercial fisheries. However, listed steelhead from the Upper Columbia and Snake River evolutionarily significant units (ESUs) migrate at the same time and are subject to the same fisheries as unlisted, hatchery-produced steelhead, chinook and coho salmon in the Columbia River.

Steelhead of this listed ESU that may be adversely affected by the proposed action are present in

Wolf Creek, a tributary to the Methow River. The Upper Columbia River Basin steelhead ESU occupies the Columbia River Basin upstream from the confluence with the Yakima River, Washington, to the United States - Canada border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion (Omernik 1987). Wolf Creek is in the Okanogan Highlands Physiographic Province. The river valleys in this region are deeply dissected and maintain low gradients except in extreme headwaters. The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Streamflow in this area is provided by melting snowpack, groundwater, and runoff from alpine glaciers.

The proposed action would occur within designated critical habitat for Upper Columbia River steelhead. Defining specific river reaches that are critical for steelhead is difficult because of the low abundance of the species and of our imperfect understanding of the species= freshwater distribution, both current and historical (65 Fed. Reg. 7764; February 16, 2000). Based on consideration of the best available information regarding the species= current distribution, NMFS believes that the preferred approach to identifying critical habitat for steelhead is to designate all areas accessible to the species within the range of specified river basins in this ESU (65 Fed. Reg. 7764; February 16, 2000).

Essential features of steelhead critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space, and safe passage conditions. Good summaries of the environmental parameters and freshwater factors that have contributed to the decline of steelhead can be found in reviews by Barnhart (1986); Pauley *et al.*, (1986); California Advisory Committee on Salmon and Steelhead Trout (CACSST) (1988); Brown and Moyle (1991); Bjornn and Reiser (1991); Higgins *et al.*, (1992); Nehlsen *et al.*, (1991); California State Lands Commission (1993); Reynolds *et al.*, (1993); Botkin *et al.*, (1995); McEwan and Jackson (1996); NMFS (1996); NMFS (1996a, 1996b, 1997); and Spence *et al.*, (1996).

Estimates of historical (pre-1960s) steelhead abundance specific to this ESU are available from fish counts at dams. Counts at Rock Island Dam from 1933 to 1959 averaged 2,600 to 3,700, suggesting a pre-fishery run size in excess of 5,000 adults for tributaries above Rock Island Dam (Chapman *et al.*, 1994). Recent five-year (1989-1993) average natural escapement for the Methow and Okanogan Rivers was 450 steelhead. Recent average total escapements for this stock was 2,400. Average total run size at Priest Rapids Dam for the same period was approximately 9,600 adult steelhead (62 Fed. Reg. 43949; August 18, 1997). Hatchery programs and harvest management have strongly influenced steelhead populations in the Upper Columbia River Basin ESU. Hatchery programs intended to compensate for habitat losses have masked declines in natural stocks and have created unrealistic expectations for fisheries (62 Fed. Reg. 43944, August 18, 1997). Collection of natural steelhead for broodstock and transfers of stocks within and between ESUs has detrimentally impacted some populations (62 Fed. Reg. 43944, August 18, 1997).

Trends in total (natural and hatchery) adult escapement for the Methow and Okanogan Rivers combined show a 12% annual decline from 1982-1993 (NMFS 1996a, 1996b). This stock, plus the Wenatchee River stock, represents most of the escapement to natural spawning habitat within the range of the ESU (62 Fed. Reg. 43949; August 18, 1997).

Steelhead in the Upper Columbia River ESU continue to exhibit low abundances, both in absolute numbers and in relation to numbers of hatchery fish throughout the region. Review of the most recent data indicates that natural steelhead abundance has declined or remained low and relatively constant in the major river basins in this ESU (Wenatchee, Methow, Okanogan) since the early 1990s (NMFS 1996a, 1996b, 1997). Estimates of natural production of steelhead in the ESU are well below replacement (approximately 0.3:1 adult replacement ratios estimated in the Wenatchee and Entiat Rivers) (62 Fed. Reg. 43949, August 18, 1997). These data indicate that natural steelhead populations in the Upper Columbia River Basin are not self-sustaining at the present time. There is also anecdotal evidence that resident rainbow trout contribute to anadromous run abundance. This phenomenon would reduce estimates of the natural steelhead replacement ratio (62 Fed. Reg. 43949, August 18, 1997).

The proportion of hatchery fish is high in these rivers (65-80%). Substantial genetic mixing of populations within this ESU has occurred, both historically as a result of the Grand Coulee Fish Maintenance Project (GCFMP) and more recently as a result of the Wells Hatchery program. Extensive mixing of hatchery stocks throughout this ESU, along with the reduced opportunity for maintenance of locally adapted genetic lineages among different drainages, represents a considerable threat to steelhead in this region (62 Fed. Reg. 43949, August 18, 1997).

The primary cause for concern for steelhead in this ESU is the extremely low estimate of adult replacement rate. The dramatic declines in natural run sizes and inability of naturally spawning steelhead adults to replace themselves suggest that if present trends continue, this ESU will not be viable (62 Fed. Reg. 43950, August 18, 1997).

Steelhead and rainbow[1] trout are found throughout Wolf Creek from the mouth to about RM 7.4. There are no natural barriers to adult steelhead from the mouth until approximately RM 10.1, where a natural falls is a fish passage barrier (USFS 1998). It is not known if anadromous steelhead use Wolf Creek, but habitat is of high quality and accessible to these fish (USFS 1998). Adult steelhead tend to migrate up the Methow River and its tributaries during spring when water

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[1]Under certain conditions, anadromous and resident *O. mykiss* are apparently capable not only of interbreeding, but also of having offspring that express the alternate life history form, that is, anadromous fish can produce nonanadromous offspring, and vice versa (NMFS 1996a). Mullan *et al*. (1992) found evidence that, in very cold streams, juvenile steelhead had difficulty attaining Amean threshold size for smoltification@ and concluded that AMost fish here (Methow River, Washington) that do not emigrate downstream early in life are thermally-fated to a resident life history regardless of whether they were the progeny of anadromous or resident parents.@

flows are high and turbid, making it difficult to make visual observations of adults or their redds. Prior to installation of a fish screen in 1999, steelhead/rainbow trout had been found in the WCRD ditch. Genetic and taxonomic analysis conducted in 1994 by the USFWS indicated that steelhead/rainbow trout collected at RM 1.7 were rainbow trout from multiple sources that showed contributions from cutthroat trout, interior redband trout and rainbow trout from more than one source (USFS 1998). These fish may or may not have been direct progeny of the anadromous form.[2]

NMFS believes that resident fish can help buffer extinction risks to an anadromous population by mitigating depensatory effects in spawning populations, by providing offspring that migrate to the ocean and enter the breeding population of steelhead, and by providing a Areserve@ gene pool in freshwater that may persist through times of unfavorable conditions for anadromous fish. A particular concern is isolation of resident populations by human-caused barriers to migration. This interrupts normal population dynamics and population genetic processes and can lead to loss of a genetically based trait (anadromy).

In 1993 a 2,000-foot segment of the Wolf Creek Ditch from the headgate to the siphon was electrofished. One adult cutthroat trout, one juvenile and two adult bull trout, and at least 50 rainbow/steelhead trout were found in the ditch (USFS 1998). A survey conducted in 1987 by Robert Steele of WDFW disclosed five juvenile steelhead at RM 1. Prior to the fish screen installation in 1999, fish that entered Wolf Creek Ditch and passed down the flume were not able to return to the creek and out-migrate to the ocean. Those fish may have survived if they were able to migrate to Patterson Lake.

B. Upper Columbia River Spring Chinook Salmon

The Upper Columbia River spring chinook salmon ESU was listed as endangered pursuant to the ESA on March 24, 1999 (64 Fed. Reg. 14308). Critical habitat for the Upper Columbia River spring chinook salmon was designated on February 16, 2000 (65 Fed. Reg. 7764). The listing status, biological information, and other information for the Upper Columbia River spring chinook salmon are further described in Attachment 2.

The species status reviews (NMFS 1998a, 1998b) cited references indicating that habitat degradation is the major cause for the range-wide decline in west coast chinook salmon stocks. Habitat alterations that have affected chinook salmon include water withdrawal, conveyance, storage, flood control (resulting in insufficient flows, stranding, juvenile entrainment, and

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[2]While there is currently no conclusive evidence regarding the relationship of resident and anadromous *O. mykiss*, NMFS believes available evidence suggests that resident rainbow trout should be included in listed steelhead ESUs in certain cases. Such cases include (1) where *O. mykiss* have the opportunity to interbreed with anadromous fish, and (2) where resident fish of native lineage once had the ability to interbreed with anadromous fish but no longer do because of human-made barriers.

increased stream temperatures), logging and agriculture (resulting in loss of large woody debris, sedimentation, loss of riparian vegetation, and habitat simplification) (Spence *et al.*, 1996; NMFS 1998a). Dams, mining and urbanization have also contributed to the partial depletion or extinction of certain chinook salmon stocks.

Other range-wide factors that impact indigenous west coast chinook salmon stocks include introduced or artificially propagated hatchery stock, commercial harvest, alteration of estuarine habitat, and natural fluctuations in marine environments (Healy 1991, NMFS 1998a, 1998b).

Spring chinook salmon of this listed ESU that may be adversely affected by the proposed action are present in Wolf Creek, a tributary to the Methow River. The Upper Columbia River spring chinook salmon ESU occupies the Columbia River Basin upstream from Rock Island Dam to the United States - Canada border. The geographic area occupied by this ESU forms part of the larger Columbia Basin Ecoregion (Omernik 1987). Wolf Creek is located in the Okanogan Highlands Physiographic Province, and includes stream-type chinook salmon that spawn upstream of the Rock Island Dam in the Wenatchee, Entiat, and Methow Rivers and their tributaries. The climate in this area includes extremes in temperatures and precipitation, with most precipitation falling in the mountains as snow. Streamflow in this area is provided by melting snowpack, groundwater, and runoff from alpine glaciers.

The proposed action would occur within designated critical habitat for the Upper Columbia River spring chinook salmon. Defining specific river reaches that are critical for spring chinook salmon is difficult because of the current low abundance of the species and of our imperfect understanding of the species= freshwater distribution, both current and historical (65 Fed. Reg. 7764; February 16, 2000).

The NMFS’ preferred approach to identifying the freshwater and estuarine portion of critical habitat is to designate all areas (and their adjacent riparian zones) accessible to the species within the range of each ESU (65 Fed. Reg. 7764; February 16, 2000). NMFS believes that adopting a more inclusive, watershed-based description of critical habitat is appropriate because it (1) recognizes the species= use of diverse habitats and underscores the need to account for all of the habitat types supporting the species= freshwater and estuarine life stages, from small headwater streams to migration corridors and estuarine rearing areas; (2) takes into account the natural variability in habitat use (e.g., some streams may have fish present only in years with plentiful rainfall) that makes precise mapping difficult; and (3) reinforces the important linkage between aquatic areas and adjacent riparian/upslope areas (65 Fed. Reg. 7764; February 16, 2000).

Essential features of spring chinook salmon critical habitat include adequate substrate, water quality, water quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space and safe passage conditions. Good summaries of these environmental parameters and freshwater factors that have contributed to the decline of spring chinook salmon and other salmonids can be found in reviews by CACSS, 1988; Brown and Moyle, 1991; Bjornn and Reiser, 1991; Nehlsen *et al.*, 1991; Higgins *et al.*, 1992; California State Lands Commission

(CSLC), 1993; Botkin *et al.*, 1995; NMFS, 1996; NMFS 1998a and 1998b; and Spence *et al.*, 1996.

Upper Columbia River spring chinook have had a substantial portion of historical habitat blocked by Chief Joseph and Grand Coulee Dams on the mainstem Columbia River (NMFS 1998a, 1998b). There are local habitat problems related to irrigation diversions and hydroelectric development, as well as degraded riparian and instream habitat from urbanization and livestock grazing (65 Fed. Reg. 7764; February 16, 2000).

Artificial propagation efforts have had a significant impact on spring-run populations in this ESU, either through hatchery-based enhancement or the extensive trapping and transportation activities associated with the GCFMP (65 Fed. Reg. 7764; February 16, 2000). Prior to the implementation of the GCFMP, spring-run chinook salmon populations in the Wenatchee, Entiat, and Methow rivers were at severely depressed levels (Craig and Suomela, 1941). Therefore, it is probable that the majority of returning spring-run adults trapped at Rock Island Dam for use in the GCFMP were not native to these three rivers (Chapman *et al.*, 1995). All returning adults were either directly transported or spawned in one of the national fish hatcheries built for the GCFMP.

In the years following the GCFMP, several stocks were transferred to the hatcheries in this area. Naturally spawning populations in tributaries upstream of hatchery release sites have apparently undergone limited introgression by hatchery stocks, based on coded wire tag recoveries and genetic analysis (Chapman *et al.*, 1995). Artificial propagation efforts have recently focused on supplementing naturally spawning populations in this ESU (Bugert, 1998), although it should be emphasized that these naturally spawning populations were founded by the same GCFMP homogenized stock. Furthermore, the potential for hatchery-derived non-native stocks to genetically impact naturally spawning populations exists, especially given the recent low numbers of fish returning to rivers in this ESU (65 Fed. Reg. 7764; February 16, 2000).

Previous assessments of stocks within this ESU have identified several as being at risk or of concern. Nehlsen *et al.*, (1991) identified six stocks as extinct. Washington Department of Fisheries *et al.*, (1993) considered nine stocks within the ESU, of which eight were considered to be of native origin and predominantly natural production. The status of all nine stocks was considered depressed. Populations in this ESU have experienced record low returns for the last few years (65 Fed. Reg. 7764; February 16, 2000).

Recent total abundance of the Upper Columbia River spring chinook salmon ESU is quite low, and escapements in 1994-1996 were the lowest in at least 60 years (65 Fed. Reg. 7764, February 16, 2000). At least 6 populations of spring chinook salmon populations in this ESU have become extirpated and almost all remaining naturally-spawning populations have fewer than 100 spawners (65 Fed. Reg. 7764, February 16, 2000). In addition to extremely small population sizes, both recent and long-term trends in abundance are downward, some extremely so. The Washington State Salmon and Steelhead Stock Inventory (SASSI, 1992) lists the Methow River spring chinook salmon stock as depressed, based on a long-term negative trend in escapement. Stock performance over the past decade would put them at the head of the Acritical@ class defined in the SASSI. Spring chinook spawning has been observed in some tributaries including Early Winters, Gold, Lake, and Wolf Creeks.

Adult spring chinook salmon migrate into the Methow River system in May and June. Spawning generally begins in late July, peaking in August, and ending in early September. For years no observations of spring chinook salmon spawning were reported in Wolf Creek, presumably because of the seasonal dewatering of the lower reach of the creek that prevented access or spawning success (USFS 1998). However, in 1991 the Haub Brothers Enterprises Trust stopped diverting from Wolf Creek, leaving 4 cfs flow in the lower creek. That summer, residents and WDFW personnel reported seeing adult spring chinook salmon in Wolf Creek attempting to spawn (personal communication with John Easterbrooks, WDFW, 1999). Restoring instream flow in the lower reaches of Wolf Creek during late summer would indicate that spring chinook salmon will attempt to enter the creek to seek suitable spawning habitat.

Because of poor returns of adult spring chinook salmon to the Upper Columbia River ESU during the last several years, the fish have been captured at the Wells Dam on the Columbia River and have been used to artificially supplement naturally spawning populations in this ESU. However, preliminary indications are that sufficient numbers of adult spring chinook salmon will be returning this year to allow passage of fish to the tributary systems to naturally spawn. If adequate instream flows are available, it is possible that some of those returning fish may attempt to spawn naturally in Wolf Creek.

A snorkel survey conducted on July 11 and August 23, 1994, by the USFS disclosed the presence of juvenile spring chinook salmon in the lower 3 miles of Wolf Creek. This finding confirms juvenile spring chinook use of Wolf Creek for rearing habitat.

Finally, a logjam in Wolf Creek located approximately 1,000' downstream of the WCRD diversion structure at RM 4 may currently be a barrier to chinook salmon passage at all flows (USFS 1998).

C. Biological Requirements

The listed species= biological requirements may be described in a number of different ways. For example, they can be expressed in terms of population viability using such variables as a ratio of recruits to spawners, a survival rate for a given life stage (or set of life stages), a positive population trend, or a threshold population size. Biological requirements may also be described as the habitat conditions necessary to ensure the species= continued existence (*i.e.*, functional habitats) and these can be expressed in terms of physical, chemical, and biological parameters. The manner in which these requirements are described varies according to the nature of the action under consultation and its likely effects on the species (see Attachment 2).

The relevant biological requirements are those necessary for the listed species to survive and recover naturally reproducing population levels at which protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stocks, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

For this consultation, NMFS finds that the biological requirements for both Upper Columbia River steelhead and spring chinook salmon are best expressed in terms of environmental factors that define flow, habitat quantity, and passage condition attributes necessary for survival and recovery of the species. These factors are described to the extent possible in the AEffects of the Action@ section. NMFS recognizes that a range of results has been reported for some of the factors, and that definitive information may not exist for all species at all life stages. Also, other environmental factors including suitable ocean conditions, freshwater habitat access, physical habitat elements, channel condition, hydrology, and properly functioning watersheds, where all of the individual factors operate together to provide healthy aquatic ecosystems, are also necessary for the survival and recovery of the listed species.

IV. ENVIRONMENTAL BASELINE

The environmental baseline represents the current basal set of conditions to which the effects of the proposed action are added. The term Aenvironmental baseline@ means Athe past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process.@ 50 C.F.R. ' 402.02. The term Aaction area@ means Aall areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action.@ Id.

Critical habitat for both the steelhead and spring chinook salmon extends to Wolf Creek and to all tributaries where anadromous fish range. Indirect effects within the action area extend down Wolf Creek from the WCRD diversion at approximately RM 4, and some distance downstream from Wolf Creek=s confluence with the Methow River. The precise downstream limit of the action area cannot be easily determined, because the extent of effects of the proposed action would vary according to flow stage.

Wolf Creek is a Tier 1 key watershed[3] and a major secondary tributary to the Methow River. It joins the Methow River 2.3 miles above the town of Winthrop. Eighty percent of the watershed

[3] Tier 1 key watersheds are those to be managed for at-risk anadromous salmonids, bull trout, and resident fish (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl; April 13, 1994).

is managed as wilderness and is considered to be in pristine condition upstream from about stream mile 4. The Middle Methow Watershed Analysis was completed by the Forest Service in 1997 and includes the Wolf Creek watershed. The Wolf Creek watershed is managed under the Okanogan Forest Plan as amended by the Northwest Forest Plan. Correcting problems (erosion control, installing fish screens, restoring fish passage, and ditch maintenance) associated with the WCRD ditch was the primary recommendation in the Watershed Analysis for restoring habitat conditions in Wolf Creek (USFS 1998).

Access to a substantial portion of historical habitat for both steelhead and spring chinook salmon was blocked by the construction of Chief Joseph and Grand Coulee Dams on the mainstem Columbia River. For both the Upper Columbia River steelhead and spring chinook salmon ESUs, there are also local habitat problems related to irrigation diversions, degraded riparian and instream habitat from urbanization, land conversion to crops and orchards, livestock grazing, and timber harvest (NMFS 1996a, 1996b, 1997, 1998a, 1998b).

The relationships between groundwater and surface flows in the Methow Basin are complex. Surface flow in the Methow River can disappear and reappear in different reaches as it flows downstream. Groundwater can reverse its direction of flow as the water level drops in the Methow River; and it is uncertain into which aquifers and streams water goes when the irrigation diversions cease (Caldwell and Catterson, 1992). Because of the hydrologic continuity of surface water and groundwater in the basin, it has been surmised that a large portion of the water diverted for agricultural or other domestic purposes returns to the Methow or the Columbia River, and thus, the water is available for other uses (including riparian vegetation watering, fish use, etc.) within the basin (Mullan *et al.*, 1992). While there may be specific instances or certain conditions where that might occur, NMFS believes that diverting flow from streams and rivers contributes to degraded environmental baseline conditions for listed anadromous fish within stream segments that could be used by fish if conditions were suitable.

The Methow Basin, including the Wolf Creek watershed, is dominated by glacial outwash sands and decomposed granitic parent material. Sand is a major component of the channel and bank substrate. Highly erosive soils are common and occur in both wilderness and non-wilderness reaches (USFS 1998). Sands and gravels deposited by past melted glaciers make up the principal Methow Valley aquifer. These substrates are so porous and permeable that a high degree of hydraulic continuity is virtually guaranteed as the groundwater and surface water exchange rapidly under certain conditions (Peterson and Larson, 1991). For example, snowmelt in the spring creates high flow levels in the Methow River, which caused water levels in wells in the Early Winters area to rise 10 to 25 feet in a one- to two-week period (Golder Associates, 1991). Conversely, during drought or low flow years, certain reaches of tributary streams and rivers to the Methow and reaches of the Methow River itself may go dry under natural conditions (without diversions) (EMCON 1993).

This high degree of hydraulic continuity is also demonstrated when certain reaches of the mainstem Methow River upstream of the Weeman bridge (RM 59.7) exhibit no surface flow during drought years from August through October and freeze solid from December through February. This is because the upper level of the groundwater aquifer is the same as the surface water level in the Methow River. If the water depth of the Methow River is one foot and the ground water aquifer drops one foot due to pumping of wells, then the Methow River is dry even though a large quantity of water is flowing downstream through the gravels under the bed of the river (Caldwell and Catterson, 1992).

Winter anchor ice[4] is another environmental baseline condition that occurs in the Methow River and certain other tributaries, and may require juvenile steelhead and spring chinook to seek areas that remain ice-free to survive. Though the extent to which damage from anchor ice effects critical habitat in Wolf Creek is not known, NMFS assumes winter freezing conditions contribute to the degraded environmental baseline conditions.

Most of the Wolf Creek watershed is located within the Okanogan National Forest and managed as wilderness. The lower 2 miles is held mainly in private ownership and has been subject to intensive management actions. Land management activities that have degraded habitat of steelhead and spring chinook salmon in this watershed include water withdrawals, unscreened water diversions, road construction and timber harvest in the Little Wolf drainage, the year round diversion of Little Wolf Creek, conversion of land to agriculture or orchards, livestock grazing, recreation, riparian habitat degradation, stream channel modifications and urbanization (NMFS 1996a, 1996b, 1997, 1998a, 1998b). In the range of both Upper Columbia River steelhead and spring chinook ESU=s, land management activities have: (1) reduced connectivity (i.e., the flow of energy, organisms, and materials) between streams, riparian areas, floodplains, and uplands; (2) elevated fine sediment yields, filling pools and reducing spawning and rearing habitat; (3) reduced instream and riparian large woody debris that traps sediment, stabilizes stream banks, and helps form pools; (4) reduced or eliminated vegetative canopy that minimizes temperature fluctuations; (5) caused streams to become straighter, wider, and shallower, which has the tendency to reduce spawning and rearing habitat and increase temperature fluctuations; (6) altered peak flow volume and timing, leading to channel changes and potentially altering fish migration behavior; (7) altered floodplain function, water tables and base flows, resulting in riparian wetland and stream dewatering; and (8) degraded water quality by adding heat, nutrients and toxicants (NMFS 1996a, 1996b, 1997, 1998a, 1998b; FEMAT 1993, USDA USFS 1993, National Research Council 1996, Spence *et al*., 1996).

The major land management activities in the wilderness are livestock grazing, hiking, hunting, and horse packing. The lower Wolf Creek watershed downstream from about RM 2 is primarily in private ownership, and has been subject to some timber removal, urbanization, stock use, riparian habitat degradation, stream channelizing, and agricultural conversion (USFS 1998).

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[4]During drought years and winter freezing conditions certain reaches of the Methow River and some tributaries may ice over from December through February. In addition, Caldwell and Catterson (1992) noted that on January 30, 1992, certain reaches of the Methow River had no surface flow but had one foot of ice covering the streambed.

Other activities in the Wolf Creek watershed that affect anadromous fish and designated critical habitat include roads and timber harvest. Impacts from road construction and timber harvest are minimal in this watershed and are isolated mainly to the Little Wolf drainage (USFS 1998). Little Wolf Creek is a tributary to Wolf Creek. All of the water from Little Wolf Creek is diverted by the WCRD on a year-round basis and no longer flows into Wolf Creek (USFS 1998). Historically, Little Wolf Creek was non-fish bearing. Today it is inhabited by rainbow trout and brook trout that access the creek by swimming up from the beaver ponds fed by the Wolf Creek ditch (USFS 1998).

Wolf Creek is an important stronghold for resident bull trout and possibly steelhead (USFS 1998). Spring chinook salmon use the lower 3 miles of Wolf Creek for spawning and rearing (USFS 1998). Westslope cutthroat trout are found in the upper reaches of Wolf Creek (USFS 1998).

An access road parallels the WCRD ditch for about .5 mile with approximately .25 mile located in the riparian reserve for Wolf Creek. The ditch has had past problems with soil instability and failure resulting in large sediment pulses being delivered to Wolf Creek and the Methow River. Many, but not all, of these unstable areas have been enclosed in a pipe, reducing the risk of bank failure (USFS 1998).

The WCRD ditch diversion dam creates a 5.5-foot jump in the Wolf Creek channel bed. This ditch diversion structure was believed to be a low flow barrier to small trout at all flows and bull trout during low flows in the late summer (USFS 1998). In July 1999, a fish ladder was installed at the diversion structure to allow fish passage of all life stages at all flow levels. The WCRD ditch was an unscreened diversion until July 1999 when WDFW installed two rotary drum screens. Historically, fish that strayed into the ditch and past the flume may have ended up in Patterson Lake. Anadromous fish that had passed down the flume had no chance of migrating back to Wolf Creek, the Methow River, or out to the ocean. They may have survived and become residualized if they were able to swim to Patterson Lake (USFS 1998).

In the Wolf Creek watershed, natural flows can vary dramatically by season. The highest flows occur toward the end of May and early June, with a 2.5-year peak flow of 750 cfs and a 50-year peak flow of 3,200 cfs (USFS 1998). Low baseflow conditions typically occur in September and/or in February**)** and in some years, irrigation withdrawals cause the lower ½ mile of Wolf Creek to go dry from about late July until October (USFS 1998).

The seven–day average, natural low flow for lower Wolf Creek has been estimated at 6.3 cfs annually and 3.5 cfs for a 20-year recurrence interval (USFS 1998) These estimates were based on regression coefficients from Methow surrogate streams developed from USFS flow data (Bennett, 2000). The USFS biological assessment (USUFS 1998) notes that Mullan et al. (1992) found that the average base flow for Wolf Creek is 8 cfs.

Spot measurements of flows on Wolf Creek are sparse. The USFS recorded the following flows in Wolf Creek on July 13, 1994:

River Mile (RM)	Streamflow (cfs)
RM 0.0 - 1.5	6.5 cfs (taken downstream of all ditches)
RM 1.5 - 4.6	10.9 cfs (taken below Wolf Creek Ditch)
RM 4.6 - 10.8	19.8 cfs (taken below North Fork Wolf Creek)

The total amount water diverted when these measurements were taken was estimated at 9 cfs, which would mean that the natural flow in the lower reach would have been approximately 15 cfs on that day.

Total adjudicated water rights for the Wolf Creek watershed are approximately 20 cfs. The WCRD diversion at RM 4.0 withdraws up to 30 cfs from Wolf Creek and Little Wolf Creek between October 1 and June 30 and then 13 cfs between July 1 and September 30. The other known water diversions are located off USFS- managed lands and can divert between April 1 and September 30. They include the Haub Brothers Enterprises Trust (4 cfs), Bud Hover (1.16 cfs) at RM 0.25 - 0.5, and the Perrow Ditch (1.2 cfs) at RM 0.5. Upon the approval of the WDOE, up to 16 cfs can be withdrawn by the Haub Brothers Enterprises Trust between May 1 and July 1. Several other landowners throughout the watershed have water rights to collectively withdraw up to 1 cfs for wildlife and stock watering (USFS 1998). The combined adjudicated water rights (20 cfs) that could be diverted from Wolf and Little Wolf creeks would exceed the seven-day low flow average of 6.3 cfs by 69 percent (USFS 1998).

The lack of comprehensive data limits a full analysis of expected flows. However, the available information shows that during drought or certain late summer/fall periods when natural (i.e., undiverted) stream flows would measure 20 cfs or less, up to100 percent of the surface stream flow available could be diverted from the creek prior to its confluence with the Methow River. There have been periods during late summer/fall baseflow conditions when diversions are in operation that the lower reach of Wolf Creek (RM 0.5 and downstream to the confluence with the Methow River) has gone dry (USFS 1998). It is for this reason that Wolf Creek is on the Clean Water Act 303(d) list as impaired for instream flows.

Based on all the above information, NMFS concludes that not all of the biological requirements of the listed steelhead and spring chinook salmon for freshwater habitat in general, and for flows in particular, are being met under the environmental baseline in this watershed. The status of the species is such that there must be significant improvement in the environmental conditions they experience, over those presently available under the environmental baseline, to meet the biological requirements for survival and recovery of these species. Further degradation of these conditions could significantly reduce the likelihood of survival and recovery of these species due to the amount of risk the listed steelhead and spring chinook salmon already face under the current environmental baseline.

V. EFFECTS OF THE ACTION

NMFS= ESA implementing regulations define Aeffects of the action@ as Athe direct and indirect effects of an action on the species or critical habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline@ (50 C.F.R. ' 402.02). AIndirect effects@ are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (*ibid*). For this proposed action, no direct effects upon listed fish result from issuance of the requested special use permit. Instead, the effects on listed fish result from operation of the Wolf Creek Ditch under the permit, and are therefore indirect effects of issuing the permit.

The Okanogan National Forest determined the proposed action was likely to adversely affect both listed steelhead and spring chinook salmon. Since that determination of effect was made, critical habitat has been designated for both species. Final rules to designate critical habitat for both Upper Columbia River steelhead and spring chinook salmon ESUs were promulgated on February 16, 2000. Critical habitat includes the action area for this action.

The Okanogan National Forest (USFS 1998) found that diverting up to 12 cfs is a significant percentage of the water available during late summer-early fall in normal to drought flow years, and that steelhead and spring chinook salmon using lower Wolf Creek may be affected in various ways by a substantial reduction in instream flow. The Okanogan National Forest considers the following to be adverse effects to the steelhead and spring chinook salmon resulting from the proposed action: 1) diverting up to 12 cfs of water during low summer baseflow conditions may result in dewatering redds and/or a reduction in egg-to-smolt fish survival through adverse habitat modification or destruction; and, 2) the water diversion may delay or inhibit migration of adult spring chinook salmon returning to spawn by creating a low flow barrier.

The USFS applied NMFS= evaluation methodology (NMFS 1996c) to assess the current environmental baseline of the Wolf Creek watershed and summarized the expected effects from the proposed action on the environmental baseline. The USFS found that for steelhead and spring chinook both peak- and baseflows would be degraded from their already Anot properly functioning@[5] environmental baseline condition. The USFS also found that temperature, physical barriers, pool frequency, pool quality, off-channel habitat, channel width/depth ratio, and refugia within the action area would be further degraded by ditch operations from their already Aat risk@ environmental baseline.

In reviewing the effects of this action on listed species and designated critical habitat, NMFS evaluated effects to the two essential features of designated critical habitat most affected by the

[5]The terms Anot properly functioning@ and Aat risk@ refer to determinations by the agency proposing the action and are described in NMFS 1996c.

proposed action. These features include (1) streamflow conditions, and (2) habitat quantity and quality.

A. Streamflow Conditions

Snow melt and glaciers are the primary sources of water in this watershed, and water flows can naturally increase rapidly depending on the size of the snowpack and occurrence of warmer weather. Two characteristics of spawning habitats directly tied to stream flow are water depth and current velocity. Salmonids typically deposit eggs within a range of depths and velocities that minimize the risk of desiccation as water level recedes. Furthermore, these locations ensure that the exchange of water between surface and substrate interstices is adequate to maintain high oxygen levels and remove metabolic wastes from the redd (Spence *et al*., 1996). Most species typically spawn at depths greater than 15 cm, although smaller trout will spawn in shallower waters (Thompson 1972). If diversions are turned on during April-May, and winter baseflow conditions are still in effect, redds located in shallower depths could be dewatered.

Streamflow is important in facilitating downstream movement of salmonid smolts. Dorn (1989) found that increases in streamflow triggered downstream movement of coho salmon in a western Washington stream. Similarly, Spence (1995) also found short-term increase in streamflow to be an important stimulus for smolt migration in four populations of coho salmon. Chinook salmon may gradually move downstream over several weeks or months. Different behaviors entail substantially different habitat requirements during the migration period (Spence *et al*., 1996). Thus the normal range of streamflows may be required to maintain normal temporal patterns of migration in a particular basin. Streamflow is also important in determining the rate at which smolts move downstream, although factors influencing the speed of migration remain poorly understood (Spence *et al*., 1996).

For salmon and other aquatic organisms, flow regimes in streams and rivers determine the amount and availability of water, the types of micro- and macrohabitats, and the seasonal patterns of disturbance to aquatic communities (Spence *et al*., 1996). High-flow events redistribute sediments in streams, flushing fine sediments from spawning gravels and allowing recruitment of gravels to downstream reaches. In addition, extreme flow events are essential in the development and maintenance of healthy floodplain systems through deposition of sediments, recharge of groundwater aquifers, dispersal of vegetation propagules, recruiting large woody debris into streams, and transporting wood downstream (Spence *et al*., 1996). Low flow conditions can reduce the amount of habitat available for juvenile salmonid refugia from predators, limit refugia suitable for avoidance of elevated water temperatures, reduce the availability of food, and increase competition for space and food sources (Gregory & Bisson 1997**).** Natural variations in river flows occur some years due to storm events of short duration that may increase surface flows for a few days. Such events are not sustained and sufficient in magnitude to provide necessary flows for fish throughout the period of normal flows in late summer and early fall.

The number of spawning salmon and trout that can be accommodated in a given stream depends on the availability of suitable habitats for redd construction, egg deposition, and incubation (Bjornn and Reiser 1991). In general, the amount of habitat suitable for spawning increases with increasing streamflow. However, excessively high flows can cause scouring of the substrate, resulting in mortality to developing embryos and alevins (Hooper 1973).

Where water is withdrawn from smaller rivers and streams, seasonal or daily flow fluctuations may affect fish, macroinvertebrates in littoral areas, aquatic macrophytes, and periphyton (reviewed in Ploskey 1983). Fluctuating water levels may delay spawning migrations, impact breeding condition, reduce salmon spawning area (Beiningen 1976), dewater redds and expose developing embryos, strand fry (CRFC 1979), and delay downstream migration of smolts. The effect of irrigation diversion operations on out-migrating steelhead and spring chinook salmon smolts in Wolf Creek is unknown due to the lack of measured data for all but minimum passage requirements at the confluence with the Methow River. The literature suggests that irrigation diversions contribute to low flows and are likely to inhibit or delay salmonid smolt migration. This delay could limit fish survival and reduce potential numbers of returning adults (NPPC 1986).

Off-channel habitat in Wolf Creek can provide important thermal refuge from warmer summer and cold winter temperatures that may occur in the adjacent reach of the Methow River. Water diversion contributes to low flow conditions in the lower 4 miles of Wolf Creek that could cause dewatering of off-channel habitat and a reduction in the quality and quantity of refugia habitat available for juvenile salmonids. Water withdrawals affect the quality of pools in the lower 4 miles of Wolf Creek by reducing depth and wetted area and width. Among juvenile salmonids this can result in increased competition for food, reduced dissolved oxygen levels, increased physiological stress, and vulnerability to predators. When seasonal low flows occur, deep pools with cool-groundwater inputs are needed to provide the necessary cover and thermal refugia for juvenile salmonids.

As mentioned above, natural flows in Wolf Creek vary dramatically by season and can range from over 3,200 cfs in the spring to complete dewatering of the lower reach in late summer (USFS 1998). Fish stocks indigenous to this watershed have adapted strategies to survive periods of natural high flows as well as low baseflow conditions.

Irrigation diversions in Wolf Creek generally commence by mid-April, continue throughout the summer, and cease by mid-October of each year. The start-up period to irrigate usually coincides with the time adult steelhead have migrated from the Columbia River into the Methow River to spawn (mid-March through May). Steelhead spawning in the upper mainstem and tributaries (Wolf Creek) occurs from April through June (USFS 1998). In cold tributary streams like Wolf Creek steelhead fry emergence often does not take place until September (Mullan, *et al.*, 1992). Wolf Creek Ditch operates when adult spring chinook salmon return to spawn (August-September). When operating during late summer-early fall baseflow conditions in normal or drought flow years, the Wolf Creek Ditch diversion historically has contributed to instream flow conditions that could delay or prevent upstream migration, reduce available spawning and rearing habitat, and elevate water temperatures above the preferred range optimal for spawning and egg survival (USFS 1998).

Because of past surface water diversion operations, peak- and base flow conditions have been determined by the USFS to be not properly functioning for the lower 4 miles of Wolf Creek (USFS 1998). Historically, that condition was most apparent during the late summer and early fall seasons when, during certain low flow water years, surface water diversion operations could contribute to drying up the lower 0.5 mile reach of Wolf Creek (USFS 1998). Further, the USFS also determined that continuing surface water irrigation diversions could degrade the Peak/Baseflow indicator of the Aquatic Conservation Strategy Objectives of the Northwest Forest Plan for salmonid fish habitat protection (USFS 1998).

The operation of the WCRD ditch has historically removed up to 13 cfs from Wolf Creek from July 1 through September 30, or approximately 65 percent of the total amount of water diverted from the creek (20 cfs), during the irrigation season. Few historical records (hydrograph or other flow data) exist to verify all of the irrigation withdrawals from Wolf Creek and Little Wolf Creek. If all the adjudicated water rights are exercised (up to 20 cfs) between July 1 and September 30, the seven-day, natural low flow average of 6.3 cfs would be exceeded by nearly 69 percent. Collectively, the irrigation diversions along the lower 4 miles of Wolf Creek can remove up to 100 percent of the total instream flow available during late summer-early fall seasons in a normal water year. Redds located in the lower 4-mile reach of Wolf Creek could become dewatered (USFS 1998).

Based upon the limited flow data available[6,] it appears that 8 cfs instream flow is within the range of natural flow conditions that can be found in lower Wolf Creek during the late summer/early fall seasons. Moreover, state agency fish biologists (Beecher and Caldwell 2000) estimate that a flow of 8 cfs at the Wolf Creek bridge will maintain 0.8 foot water depth in the travel corridor at the bridge location. Consequently, based on the limited data available, NMFS believes that these requirements would protect all life stages of listed anadromous fish in the Wolf Creek watershed.[7]

The NMFS recognizes that the data referenced above are sparse and do not cover all the natural cycles of climate and water yield. However, this scientific information is currently the best available for determining natural late summer/fall baseflow conditions for lower Wolf Creek. Additional flow data will be obtained by the USFS and the ditch operators and will be used to

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[6] The NMFS is not aware of any Instream Flow Incremental Methodology (IFIM) studies for Wolf Creek.

[7] NMFS acknowledges that these flow levels differ from those in draft biological opinions. Previous numbers were based on measurements taken at different locations and erroneous assumptions for flow and depth relationships in lower Wolf Creek.

refine future flow regimes. In the near term, the permittee is conducting monitoring to link depth and flow regimes at the county bridge site during the 2000 irrigation season. The resulting studies will be considered in establishing a flow regime for the 2001 season.

Particular streamflow effects on each of the two listed species are discussed below.

1. Upper Columbia River Steelhead

In the upper Methow Basin watersheds, including Wolf Creek, steelhead spawning may continue into early July (USFS 1998). Fertilized embryos develop for a period of one to several months, depending on water temperature and dissolved oxygen availability, before hatching occurs. Incubating eggs or alevins (hatched larval stage fish) would likely still be in the gravels when flows would naturally begin dropping below optimal conditions. Operating the Wolf Creek Ditch would contribute to naturally declining flow conditions in late summer that could affect developing embryos or strand alevins still in the gravel, potentially resulting in hindered embryonic development and/or direct mortality. Steelhead eggs or alevins may also be at a higher risk for dewatering/stranding where spawning fish have deposited their eggs at the margins of streams.

Operation of the WCRD ditch to divert water would contribute to the already naturally declining instream flows during late summer-early fall; thus decreasing the quantity of refugia habitat available to juvenile steelhead to avoid predators, reducing the availability of food, and concentrating fish to compete for space and food. However, WCRD=s proposal to modify or cease their diversion to maintain both 8 cfs and a channel depth of 0.8 feet as measured at the Wolf Creek Bridge is expected to provide both passage and rearing flows for steelhead.

Minimum depth that will allow passage of steelhead is approximately 18 cm (0.58 feet) (Thompson 1972, Bjornn and Reiser). Substantially greater depths may be needed to negotiate large barriers (Stuart 1962). The ability to pass a barrier is also influenced by pool configuration. Less severe inclines may be more difficult to pass if pool depths are inadequate and velocities are high (Stuart 1962). Late winter-spring flow conditions in Wolf Creek are not expected to impede returning adult steelhead.

Migrating juvenile fish are particularly vulnerable to predation because they often are concentrated and may move through areas with limited cover and a high abundance of predators. The lower reach of the Wolf Creek watershed has been modified by land management actions that have removed habitat complexity (riparian vegetation and large woody debris) needed for juvenile salmonids (USFS 1998). Operating the WCRD ditch during natural declining flow conditions, particularly during late summer-early fall, could increase competition among juvenile steelhead for shelter/cover, food, and space. However, implementing the proposed channel modification work in the lower Wolf Creek reach will add channel complexity, pool and riparian habitat, and large woody debris that presently is lacking. In addition, the switching of surface water diversion to Lake Patterson storage or groundwater wells during low flow conditions will significantly improve instream flows for juvenile fish rearing.

Depending upon the species or population, some juvenile salmonids migrate to the sea or lakes, while others remain in a relatively small reach of stream for their entire lives (Bjornn and Reiser 1991). All species require unobstructed (either chemically or physically) access to upstream or downstream reaches for migration or dispersal to feeding grounds (Spence *et al*., 1996). In addition, species and stocks differ in their migratory behavior (i.e., timing and speed). As previously referenced in this BO, there is evidence to suggest that juvenile steelhead in Wolf Creek that do not attain mean threshold size for smoltification because of cold-water temperature will remain a resident in freshwater. Thus, steelhead likely reside year round in Wolf Creek and may need to seasonally migrate up or downstream in search of food, cover or to avoid seasonal stranding. Operating the Wolf Creek ditch during naturally declining flow conditions could temporarily inhibit the upstream or downstream passage of juvenile fish, but it is expected that maintaining 8 cfs flow and a minimum channel depth of 0.8 feet depth in lower Wolf Creek will provide unrestricted passage conditions.

Most of the habitat indicators in the environmental baseline for the lower 4-mile reach of Wolf Creek are functioning at risk for steelhead and that the proposed action may degrade an essential habitat component (instream flow). NMFS strongly believes, within the context of this proposed action, that restoring instream flows is the single most important habitat feature that would promote conservation of the species under ESA, and aid in the long-term restoration of habitat. The proposal to maintain 8 cfs and a minimum channel depth of 0.8 feet in lower Wolf Creek would aid in restoring riparian vegetation and, in the long-term, promote bank stabilization, shade, food sources and refugia for all life stages of steelhead.

2. <u>Upper Columbia River Spring Chinook Salmon</u>

Naturally declining flows to seasonal low baseflow conditions in Wolf Creek would coincide with the arrival of adult spring chinook salmon returning to spawn. In late summer of 1991, the Haub Brothers Enterprises Trust was not diverting their adjudicated 4 cfs flow. That water remained instream and WDFW personnel observed adult spring chinook attempting to spawn in lower Wolf Creek (telephone conversation with John Easterbrooks). The available flow data would suggest that during average and above average flow years, returning adult spring chinook salmon would not likely be impeded or hindered from accessing potential spawning habitat under the proposed action. In low flow years, there may not be sufficient water for passage of adult chinook even with no diversions by WCRD.

Stream conditions during incubation can have a dramatic effect on the survival of incubating eggs. Experiments by Gangmark and Broad (1955) and Gangmark and Bakkala (1960) in Mill Creek, California, demonstrated that aside from large floods, chinook egg mortality was associated with low oxygen in the spawning gravel (less than 5 ppm) and poor percolation of water through spawning gravel (Groot and Margolis 1991). Adequate water percolation through the spawning gravels is essential for egg and alevin survival. Becker et al. (1982, 1983) investigated the effects of dewatering artificial chinook redds on survival and development rate of embryos at various stages of development. Alevins were most sensitive to both periodic short-term dewatering and a prolonged single dewatering, surviving at less than 4 percent in periodic dewaterings of one hour or a single dewatering of six hours (Groot and Margolis 1991). The development rate of embryos was also reduced in those instances in which survival was affected but not in instances when survival was good (Groot and Margolis 1991). The proposed action is not expected to result in dewatering or measurably preventing the survival of any chinook redds because minimum instream flow of 8 cfs and a minimum channel depth 0.8 feet would be maintained.

Streamflow during the spawning migration must be sufficient to allow passage over physical barriers including falls, cascades, and debris jams; as a result, migrations of many stocks occur coincident with high flows (Spence *et al*., 1996). Spring and summer chinook adults migrate during periods of high flows that allow them to reach spawning tributaries in headwater reaches, while fall-run stocks, which typically spawn in lower reaches, may enter streams during periods of relatively low flow.

Minimum depths that will allow passage of large chinook salmon is 24 cm (9.4 inches) (Thompson 1972, Bjornn and Reiser 1991); however, substantially greater depths may be needed to negotiate large barriers (Stuart 1962). The ability to pass a barrier is also influenced by pool configuration. Less severe inclines may be more difficult to pass if pool depths are inadequate and velocities are high (Stuart 1962). In the past, low instream flow or no instream flow conditions in the lower Wolf Creek hindered, delayed, or prevented adult spring chinook salmon from entering the stream to spawn from late July to September.

Chinook salmon will spawn in water depths from a few centimeters to several meters (Bell 1991), which suggests the range in depths that chinook find acceptable is very broad (Groot and Margolis, 1991). Optimum spawning depths for chinook are considered to be 0.8 feet (Thompson 1972). It appears the maintaining a minimum 8 cfs instream flow and a channel depth of 0.8 feet (9.6 inches) would allow chinook upstream passage and provide adequate depth for spawning.

Depending upon the species or population, some juvenile salmonids migrate to the sea or lakes, while others remain in a relatively small reach of stream for their entire lives (Bjornn and Reiser 1991). All species require unobstructed (either chemically or physically) access to upstream or downstream reaches for migration or dispersal to feeding grounds (Spence *et al.*, 1996). In addition, species and stocks differ in their migratory behavior (i.e., timing and speed). For example, juvenile chinook salmon may gradually move downstream over several weeks or months (Spence *et al.*, 1996).

Migrating juvenile fish are particularly vulnerable to predation because they are often concentrated and may move through areas with limited cover and a high abundance of predators. The lower reach of the Wolf Creek watershed has been modified by land management actions that have removed habitat complexity (riparian vegetation and large woody debris) needed for juvenile salmonids (USFS 1998). The historic operation of surface water diversion during low baseflow conditions would increase competition among juvenile chinook salmon for shelter/cover, food, and space in the action area. Those conditions would be expected to measurably improve if 8 cfs and 0.8 foot channel depth were maintained, along with the anticipated modifications to improve in-channel habitat complexity, pools, large woody debris, and riparian habitat.

Most of the habitat indicators in the environmental baseline in the lower Wolf Creek watershed are functioning at risk for spring chinook salmon. NMFS strongly believes, within the context of this proposed action, that restoring flows is the single most important habitat feature that would promote conservation of listed species and aid in the long-term restoration of habitat. It is expected that maintaining the proposed instream flow in lower Wolf Creek would provide adequate flow to meet the short-term biological needs of spring chinook and, in the long-term, would aid in restoring riparian vegetation, stabilizing stream banks, and increasing shade, food sources, and refugia..

3. Groundwater Recharge

There is widespread belief in the Methow Valley that irrigation water that infiltrates anywhere is quickly returned to streams where that water can support fish and productive fish habitats. No information to verify the claims that groundwater recharge is ubiquitous (such as data control points or gauges) was presented during this consultation. In addition, a search of the literature has found no evidence of any well log data or subsurface well control to verify transmissivity rates that would support that belief. The IFIM report (Caldwell and Catterson 1992) suggests that aquifers are complex and not well understood for the Methow Valley. According to Mullan et al (1992), Aavailable geologic data are inadequate for delineating formations and aquifers that have relatively good or poor water-yielding characteristics in the Methow Valley.@ Mullan et al (1992) also cite Nassar (1973) that the actual contribution of return water depends not only on the storage characteristics of the aquifer, but also on the local hydraulic gradient and the degree of transmissivity between the stream and the groundwater. In areas where return flows are suspected (e.g., Early Winters Creek, Chewuch River and Wolf Creek subbasin) the flows often do not reach the main channel for many miles downstream. The delay in returning flows results in dewatering of stream and tributary habitats (EMCON 1993).

The IFIM report also discusses the effects when ditches are turned off in the fall and water levels in the Methow River do not immediately return to full flows (Caldwell and Catterson 1992). For example, six days after the Chewuch irrigation ditches stopped diverting 64.2 cfs in early October, 1991, the flow in the Methow River had increased only 1 cfs compared to flows during the diversions (from 228 to 229 cfs). Other observed effects were a recovery of only 39 percent of pre-diversion river flows near Twisp two days after the irrigations were turned off. The authors of the IFIM report speculate that the missing water was still bound in groundwater along the riparian areas, where the demand for bank storage would not be met for some period of time

(Caldwell and Catterson 1992).

This information suggests that operating surface water diversions during low baseflow conditions not only reduces the instream flow that adversely affects listed steelhead and spring chinook salmon directly, but would also contribute to a seasonal reduction in the volume of water stored in the riparian groundwater bank. A seasonal reduction in riparian groundwater storage exacerbated by water withdrawals, which coincides with the growing season, could potentially inhibit or prevent riparian vegetation from establishing or obtaining future proper functioning condition because water may not be available to the root zone during the growing season. Thus, the diminished health and lower density of plants, shrubs, or trees (riparian community) that provide bank stabilization, shade, organic debris, food sources (insects), and future large woody debris in the action area may have significant long-term adverse affects to designated critical habitat for both steelhead and spring chinook salmon. The adverse effects on listed fish of reduced groundwater storage during irrigation season likely outweigh any benefits of later groundwater recharge from irrigation withdrawals.

B. Habitat Quantity and Quality

The physical structure of streams and rivers play a significant role in determining the suitability of aquatic habitat to salmonids as well as other organisms upon which salmonids depend for food. These structural elements are created through interactions between natural geomorphic features, the power of flowing water, sediments delivered to the channel, and riparian vegetation which provides bank stability and large woody debris inputs (Spence *et al.*, 1996). Spatial differences and gradients give rise to a variety of macro- and microhabitat attributes that are used by salmonids at various stages of their life histories. Macrohabitat features include pools, glides, and riffles. The relative frequency of these habitat types changes with the size of the stream, the degree of channel constriction, and the presence of large woody debris (Spence *et al*., 1996). Microhabitat attributes include characteristics such as substrate type, cover, depth, hydraulic complexity, and current velocity (Spence *et al*., 1996). Ditch operation, especially when conducted during summer/early fall flow conditions, could appreciably diminish both macro- and microhabitat features referenced above by reducing the volume and velocity of water in the creek.

Activities in the watershed that affect anadromous fish and proposed critical habitat include stock grazing and recreational pack stock use in the wilderness areas, off-forest irrigation diversions, conversion of land to agricultural and ranch uses, urbanization, the loss of riparian habitat in the lower watershed, and channelizing the lower reach of Wolf Creek. Most road construction and timber harvest activities in the watershed have been conducted in the Little Wolf Creek drainage, which was historically a non-fish bearing stream that is presently diverted in its entirety.

There are approximately 10 miles of stream available to anadromous fish in the watershed, with few or no roads in the riparian zone. Approximately 80 percent of the watershed is designated wilderness and provides near pristine habitat conditions. Wilderness lands begin just upstream of the WCRD diversion site, and approximately 6 miles of stream habitat available to anadromous fish is located within wilderness. Most land disturbance activities are located in the lower watershed where soil erosion and sediment delivery rates are naturally high and easily accelerated by management activities. The action area for this proposal is located in the lower Wolf Creek watershed where land management activities conducted on both federal and private lands have contributed to a degraded environmental baseline condition.

Although it was not possible with the available data to complete the quantification of habitat loss and assess its effect on the Wolf Creek and Methow River steelhead and spring chinook population, any habitat loss becomes a concern given the environmental baseline condition of the lower Wolf Creek watershed. As noted in the Environmental Baseline section, other management activities have caused elevated water temperatures, loss of pools, sedimentation, and loss of large wood in the lower reaches of Wolf Creek. The effect of those activities likely combines with this water withdrawal to reduce frequency and depth, and thus reduce habitat quantity in Wolf Creek. However, maintaining 8 cfs and a minimum in-channel depth of 0.8 foot is expected to provide instream flows that would protect all life stages of both steelhead and spring chinook salmon. Further, the proposed channel modification work in lower Wolf Creek is expected to aid in the long-term restoration of in-channel habitat complexity, add pools and large woody debris, and stabilize the stream banks by the addition of riparian plantings.

C. Summary of Effects

The upper Wolf Creek watershed is functioning appropriately for the factors and habitat indicators that influence salmonid populations and production (USFS 1998). However, the lower watershed, including the action area, has been subject to continuing land management activities that have degraded riparian and instream habitats. The proposed action would result in seasonal irrigation diversion from Wolf Creek that would degrade the instream peak/base flow habitat indicator. For steelhead, the importance of that reduction in instream flow could become magnified during the late summer-early fall when embryos in their redds would be hatching and alevins are emerging from the gravels, and for rearing juveniles. For spring chinook, the reduction in instream flow could become magnified for adults attempting to return to spawn and for rearing juveniles. The magnitude of that degradation is expected to be minimized in both scope and duration by maintaining a minimum instream flow of 8 cfs, as measured at the county bridge crossing Wolf Creek, and maintaining a minimum in-channel depth of 0.8 foot throughout the travel corridor from the county bridge to the confluence of Wolf Creek and the Methow River**.** Based on the limited data available, NMFS believes that this action would maintain near natural flow conditions during critical periods in the late summer and early fall and thus would provide adequate depth for passage and spawning. Finally, the upgrading of the WCRD=s water distribution system, implementing the 2000 Year Operating Plan, and converting to Lake Patterson storage or groundwater wells as a water source will reduce future reliance on surface water diversion for irrigation purposes during seasonal low flow periods.

VI. CUMULATIVE EFFECTS

Cumulative effects are defined as Athose effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation@ (50 CFR. ' 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Gradual improvements in habitat conditions for salmonids are expected on Federal lands as a result of Northwest Forest Plan implementation. Significant improvements in Upper Columbia River steelhead and Upper Columbia River spring chinook salmon production outside of USFS and Bureau of Land Management lands is unlikely without changes in forestry, agricultural, and other practices occurring within non-Federal riparian areas. NMFS is aware that significant efforts, such as the Omak Creek Watershed Plan (1995), have been developed to improve conservation and restoration of steelhead and chinook salmon habitat on non-Federal land. Local improvements to currently degraded habitat conditions may occur as a result of water diversion upgrades being planned in the Methow Basin.

Existing studies (Peterson and Jackson, 1990, EMCON, 1993, and Methow Valley Planning Committee, 1994) have documented the potential build-out of the Methow Basin that would likely occur if individuals convert water currently used for irrigation to domestic or other annual uses. The impacts to instream flows during low flow periods, late summer-early fall and winter, have not been documented. However, estimates from these reports show that if only 5 percent of the saved water from total irrigable acres (12,900 acres) is converted to domestic use, an additional 950 homes could be built in the basin, which could support approximately 2,800 people. The basin's current population is only 4,500. Given the fragile nature of this ecosystem, it is clear that tighter land use and water use regimes are required to not only recover the listed species, but to support the build-out that could be realized from using only 5 percent of the saved water.

One measure of potential cumulative impacts is the number and magnitude of applications for water rights within the action area in the lower Wolf Creek watershed. As of this date, there are 4 new applications to WDOE for groundwater wells, totaling 0.28 cfs. The trend toward groundwater claims is expected to continue.

The amount of water withdrawn from Wolf Creek by ditches other than the WCRD ditch has a cumulative adverse effect on instream flows for fish. The WCRD must pass 7 cfs downstream for other senior water rights holders to divert before it can begin diverting water from Wolf Creek. There are also other off-forest diversions on lower Wolf Creek. Because those downstream diversions do not require any federal permit, there is no federal action involved and consequently there will be no ESA consultation. Water withdrawals requiring no federal action may be expected to continue at similar levels.

Until improvements in non-Federal land management practices occur, NMFS assumes that future private and state actions will continue at similar intensities as in recent years. Now that the Upper Columbia River steelhead and spring chinook salmon ESUs are listed under the ESA, NMFS assumes that non-Federal landowners in those areas will also take steps to curtail or avoid land management practices that would result in the take of those species. Such actions are prohibited by section 9 of the ESA and subject to the incidental take permitting process under section 10 of the ESA. Future Federal actions, including the on-going operation of hatcheries, harvest, and land management activities, will be reviewed through separate section 7 processes.

VII. CONCLUSION

Access to a substantial portion of historical habitat for both steelhead and spring chinook salmon was blocked by the construction of Chief Joseph and Grand Coulee Dams on the mainstem Columbia River. Because of this reduction in access to historical habitat, and because of the relatively pristine habitat conditions in the upper watersheds of the Methow Basin, accessible habitat in the Methow Basin assumes a significance in the survival and recovery of these ESUs disproportionate to the amount of habitat in these watersheds. Consequently, NMFS must closely scrutinize water diversion in the basin that could significantly degrade this important habitat.

The timing and operation of diversion may affect embryonic (alevin) development and fry emergence of steelhead from the gravel in lower Wolf Creek by contributing to reduced instream flow in late summer-early fall. Adult spring chinook salmon returning to spawn in Wolf Creek may be affected by declining instream flows that may hinder or inhibit passage to suitable spawning habitat. In addition, rearing habitat (cover, feeding, migration) for juvenile steelhead and spring chinook may be degraded or dewatered. These effects may result in displacement of fish and/or mortality of eggs and fish. NMFS expects, however, that operating the WCRD diversion to maintain a minimum 8 cfs instream flow and an 0.8 feet in-channel depth in lower Wolf Creek will not measurably degrade any of the habitat indicators for steelhead or spring chinook salmon within the action area and will not appreciably reduce their likelihood of survival and recovery. Additional data gathered by the permittee will be used to refine necessary flow levels and reduce uncertainties in future irrigation seasons.

The applicant's agreement with the USFS to maintain 8 cfs streamflow and 0.8 foot channel depth is a significant improvement over past conditions and, according to the best scientific information available at this time, would approximate late summer/early fall natural streamflow conditions. The essential life stage requirements for passage, spawning, and rearing for steelhead and spring chinook salmon likely will be achieved, and thus the proposed action will not appreciably reduce the likelihood of survival and recovery of the listed species. In addition, NMFS expects that the upgrading of the WCRD water distribution system and the proposed restoration of approximately 400 feet of the lower Wolf Creek stream channel will significantly contribute to water conservation and, in the long-term, improved instream habitat conditions for anadromous fish.

The NMFS concludes that the proposed action will not jeopardize the continued existence of the Upper Columbia River steelhead or spring chinook salmon or result in the destruction or adverse modification of their designated critical habitat within the action area. The determination of no jeopardy was based on the current status of the Upper Columbia River steelhead and Upper Columbia River spring chinook salmon, the environmental baseline for the proposed action area, and the effects of the proposed action.

VIII. INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined by NMFS Proposed Rule to include significant habitat modification or degradation that results in death or injury to listed species by Asignificantly impairing behavioral patterns such as breeding, spawning, rearing, migrating, feeding, and sheltering.@ Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are non-discretionary; they must be implemented by the action agency so that they become binding conditions of any grant or permit issued to the applicant as appropriate, in order for the exemption in section 7(o)(2) to apply. The USFS has a continuing duty to regulate the activity covered in this incidental take statement. If the USFS fails to retain the oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

A. Amount or Extent of the Take

The NMFS anticipates that the action covered by this biological opinion may result in incidental take of listed species through stream diversion or low flows. The proposed action may also result in the adverse modification of critical habitat of both steelhead and spring chinook salmon caused by seasonal water diversion. The proposed action, modified by the reasonable and prudent measures and terms and conditions, is expected to result in a substantial decline in the extent of take. Effects of the action such as these are largely unquantifiable, but are not expected to be measurable as long-term effects on the species= habitat or population levels. The best scientific and commercial data available are not sufficient to enable NMFS to estimate a specific amount of incidental take to the listed species themselves. In instances such as this, NMFS anticipates the expected level of take as Aunquantifiable.@ Based on the information in the BA, NMFS anticipates that an unquantifiable amount of incidental take could occur as a result of the action covered by this biological opinion.

B. Reasonable and Prudent Measures

The following reasonable and prudent measures are necessary and appropriate to minimize take of the listed species.

1. The USFS will require that the WCRD headgate works be inspected by its operators to ensure proper operation prior to commencing ditch operations each irrigation season.

2. The USFS will require that diversion flows will not exceed the design criteria for the fish screen, or 12 cfs, whichever is less.

3. The USFS will condition its special use permit to require the permittee to maintain a minimum instream flow of 8 cfs, as measured at the county bridge crossing Wolf Creek, and to maintain a minimum in-channel depth of 0.8 foot throughout the travel corridor from the county bridge to the confluence of Wolf Creek and the Methow River.

4. The USFS will require the permittee to ramp down diversion flows prior to shutting off the diversion. This is necessary to stimulate fish to voluntarily migrate out of the diversion bypass reach prior to ditch turn-off.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the parties must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. The USFS will inspect the headgate and fish screen works at the completion of any structural improvements to ascertain required construction standards have been met.

2. The USFS will require the permittee to maintain a fish screen that is adequate to prevent impingement or injury to fish at the full range of potential diversion flows. The fish screen design, construction, and maintenance will be consistent with the screen criteria developed by the National Marine Fisheries Service (NMFS 1995).

3. The USFS will require the permittee to install and maintain continuous flow monitoring devices located at (1) the upstream point of diversion within the Wolf Creek Ditch, (2) in Wolf Creek immediately downstream of the WCRD diversion, and (3) at the Wolf Creek Bridge near the confluence of Wolf Creek with the Methow River. The permittee will provide flow data from these devices to the USFS or its designee upon request. Each year the permittee will provide flow monitoring data from these devices to the USFS by November 1. The permittee also will provide a report to the USFS by the end of the calendar year, that summarizes an analysis of the flow data collected over the irrigation season

4. The USFS will require the permittee to provide notification to the USFS when instream flow at the Wolf Creek Bridge gauge reaches 18 cfs. During this period, the USFS will ensure that the permittee begins preparation to incrementally ramp down the flows at the headgate to stimulate fish rearing in the ditch upstream of the fish screen to voluntarily migrate from the ditch via the bypass flow. This flow ramping-down procedure will be implemented for 5 to 7 days prior to ditch shut-off. Ramp down procedures will be consistent with those promulgated by WDFW in its guidance on Fish Bypass Operation and Procedure For Coordinating Fish Bypass and Diversion Headgate Operation.

5. The USFS will require that the permittee modify its diversion operations to maintain instream flow of 8 cfs, as measured at the county bridge crossing Wolf Creek, and a channel depth of 0.8 foot throughout the travel corridor from the Wolf Creek bridge to the confluence of Wolf Creek with the Methow River. This means that the permittee will cease or delay diversion if either 8 cfs or 0.8 foot channel depth cannot be maintained.

6. The USFS will record the date and the instream flow at which surface water diversions are turned on and when flows are reduced or discontinued for the season. Those records will be forwarded to NMFS, Washington State Habitat Branch in Olympia, Washington, by November 1 of each year in which the ditch operates.

7. The USFS will require that each year, any fish habitat surveys, snorkel surveys, water use measurements or monitoring reports conducted by the permittee will be forwarded to the USFS and NMFS, Washington State Habitat Branch in Olympia, Washington, by November 1.

8. The USFS will require the permittee to continue flow studies on Wolf Creek and forward the results of the studies to the USFS and NMFS, Washington State Habitat Branch in Olympia, Washington, by the end of each calendar year. The studies will include the following:

   a. An assessment of the streamflow hydrograph for multiple years.

   b. An assessment of depth and flow relationships in Lower Wolf Creek.

   c. An analysis of flow requirements for all life stages of listed fish species throughout Wolf Creek.

IX. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat. The following are discretionary suggested actions that the Forest Service can implement in furtherance of its responsibilities under section 7(a)(1) of the ESA.

For the year 2000 and beyond, a long-term monitoring plan should be developed to define and implement a monitoring protocol for an adaptive management plan.

For the year 2000 and beyond, the permittee should develop an assessment of the impacts of the potential WCRD groundwater withdrawal on instream flows in Wolf Creek.

For the year 2000 and beyond, the permittee plans to continue developing a plan that complies with the format and content requirements of a Habitat Conservation Plan (HCP), as provided under ESA section 10(A)(2)(A). An HCP would include commitments to complete ongoing flow studies for multiple irrigation seasons.

X. REINITIATION OF CONSULTATION

Consultation must be reinitiated if: the amount or extent of taking specified in the Incidental Take Statement is exceeded, or is expected to be exceeded; new information reveals effects of the action that may affect listed species in a way not previously considered; the action is modified in a way that causes an effect on listed species that was not previously considered; or, a new species is listed or critical habitat is designated that may be affected by the action (50 CFR ' 402.16).

The permittee is continuing to investigate ways and means to install new equipment or to upgrade existing infrastructure in order to deliver water to its constituents. Those future action components are described in WCRD=s Operations Plan for Year 2000 dated May 9, 2000. As those action items are implemented, NMFS anticipates the USFS and the permittee will provide NMFS with updates to the operational plan and, where necessary, request reinitiation of this consultation to update this biological opinion.

NMFS has based its determination of ESA flow levels needed to avoid jeopardizing the listed species on the best available scientific information. New information on flow levels in the Methow Basin is being gathered, and NMFS encourages submission of additional scientific information to further define the variability of flows in Wolf Creek and other Methow River tributaries. When this information becomes available, NMFS anticipates the USFS and the special use permittees will provide the new data to NMFS and contact NMFS to schedule meetings to analyze the new data. Reinitiation of this consultation to revise instream flow levels will be initiated if warranted by the new information.

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Attachment 1.	Upper Columbia River Steelhead: Biological Requirements and Status Under the Environmental Baseline
Attachment 2.	Upper Columbia River Chinook Salmon: Biological Requirements and Status Under the Environmental Baseline
Attachment 3.	The Habitat Approach: Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids